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NOTES ON GEOGRAPHIC DISTRIBUTION

Chironius fuscus (Linnaeus, 1758) (Serpentes: Colubridae): Distribution extension, new state record and variation in southern Brazil

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ABSTRACT: The colubrid snake *Chironius fuscus* (Colubridae) is a widely distributed species in South America, exhibiting a disjunct distribution associated to rainforests of Amazonia and Eastern Brazil (from Pernambuco to Paraná States). In this study, we present new distributional data from Paraná state and extend the known range to the state of Santa Catarina. We also present meristic and morphometric data of the southernmost populations of the species.

The colubrid genus *Chironius* Fitzinger, 1826 is a group of Neotropical snakes, whose monophyly is strongly supported by hemipenial and pholidotic characters (Hollis 2006). The genus is characterized by the presence of low, even number (10 or 12) of dorsal scale rows at midbody and currently comprises 16 species (Dixon *et al.* 1993; Hollis 2006; Kok 2010; Uetz 2012). These species are diurnal, terrestrial to arboreal and distributed from Honduras in Central America and Saint Vincent Island in the Caribbean Sea to the mouth of the Río de la Plata, Uruguay, in southern South America (Dixon *et al.* 1993; Hollis 2006). In Brazil, 11 species are recognized: *Chironius bicarinatus* (Wied, 1820), *C. carinatus* (Linnaeus, 1758), *C. exoletus* (Linnaeus, 1758), *C. flavolineatus* (Jan, 1863), *C. foveatus* Bailey, 1955, *C. fuscus* (Linnaeus, 1758), *C. laevicollis* (Wied, 1824), *C. laurenti* Dixon, Wiest nad Cei, 1993, *C. multiventris* Schmidt nad Walker, 1943, *C. quadricarinatus* (Boie, 1827), and *C. scurrulus* (Wagler, 1824) (Bérnils and Costa 2011).

Chironius fuscus is distinguished from the other species of the genus *Chironius* by presenting a combination of 10 dorsal scales at midbody, anal plate single, paravertebral scales varying from smooth to strongly keeled or absent, lower portion of the supralabials cream colored and 39 to 51 maxillary teeth (Dixon *et al.* 1993). These authors recognized two subspecies, *C. f. fuscus* widely distributed in South America, and *C. f. leucometapus*, restricted to the highlands of eastern Andean slope in Peru. We agree with Hollis (2006) that the morphological differences and distribution data presented by Dixon *et al*. (1993) are sufficient for recognizing *C. f. leucometapus* as a valid species. Thus, the concept of *C. fuscus* recognized in this work is restricted to the nominal subspecies.

From this perspective, *Chironius fuscus* presents a disjunct distribution, occurring in the Amazonian and Atlantic forests. This species is widely distributed in Amazonia, with records from Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Suriname e French Guyana (Dixon and Soini 1977; Duellman 1978; Gasc and Rodrigues 1980; Miyata 1982; Hoogmoed 1982; Chippaux 1986; Fugler 1988; Pefaur 1992; Dixon *et al.* 1993; Kok 2010; Rivas *et al.* 2012). In Brazil, *C. fuscus* was recorded in all Amazonian states (Hoge 1967; Hoge *et al.* 1972; Cunha and Nascimento 1982; 1993; Cunha *et al.* 1985; Nascimento *et al.* 1988; Zimmermann and Rodrigues 1990; Dixon *et al.* 1993; Silva-Jr. 1993; Silva-Jr. and Sites-Jr. 1995; Martins and Oliveira 1998; Yuki *et al.* 1999; Frota *et al*. 2005). In Eastern Brazil, the species is associated to the Atlantic Forest domain, with records from Pernambuco to Paraná states (Amaral 1978; Bailey 1955; Marques *et al.* 2001; Freitas 2003; Marques and Sazima 2004; Argôlo 2004; Bérnils *et al.* 2007; Centeno *et al*. 2008; Pontes and Rocha 2008; Pontes *et al.* 2008; Pontes *et al.* 2009; Salles and Silva-Soares 2010; Salles *et al.* 2010; Freitas 2011; Vrcibradic *et al.* 2011). Certainly, the records of this species for the state of Paraná (Marques *et al.* 2001; Bérnils *et al*. 2007) are based on herpetological collections. However, the literature brings no explicit indication of voucher specimens.

In this study, we present the known localities of occurrence of *Chironius fuscus* in Paraná, as well as a range extension of the species for the state of Santa Catarina. Considering distribution and taxonomic problems related to the species, and the limited information available in the literature regarding its morphological variation, we present meristic (pholidotic) and morphometric data of 18 specimens from Paraná and two of Santa Catarina, housed in the herpetological collection of the Museu de História Natural Capão da Imbuia, municipality of Curitiba, Paraná

(MHNCI). Coordinates of the localities were obtained from Google Earth Software Version 5.1.3535.3218 (*Datum* WGS 84). Coordinates of the municipal seats are presented when information about the precise location of records was not available.

The occurrence of *Chironius fuscus* in the state of Paraná is confirmed by the following toponyms (Figure 1): Municipality of Antonina: "Bairro Alto" (25°15'49" S, 48°44'24" W; 17 m), MHNCI 11325; "Cacatu" (25°18'32" S, 48°45'36" W; 81 m), MHNCI 11164 (Figure 2); "PR-405, between Lageado and Fazenda Bom Jesus I" (approximately 25°18'47" S, 48°40'48" W; 6 m), MHNCI 12540; "Reserva Natural do Rio Cachoeira, Trilha do Meio" (25°15'13" S, 48°40'05" W; 70 m), MHNCI 11947; "Reserva Natural do Rio Cachoeira, mouth of the Faisqueira River" (25°24'47" S, 48°39'52" W; 12 m), MHNCI 11227; "Curitibaíba River, PR-340" (25°23'10" S, 48°46'57" W; 7 m), MHNCI 11957. Municipality of Guaraqueçaba: no specific locality (25°17'14" S, 48°19'01" W; 23 m), MHNCI 392, MHNCI 7625, MHNCI 7720, MHNCI 9198; "Tagaçaba" (25°13'21" S, 48°27'23" W; 9 m), MHNCI 3183. Municipality of Guaratuba: "Cabaraquara, access to the Iate Clube" (25°50'12" S, 48°34'20" W; 18 m), MHNCI 6911. Municipality of Morretes: no specific locality (25°28'44" S, 48°49'54" W; 24 m), MHNCI 10512; "Anhaia" (25°30'14" S, 48°50'45" W; 25 m), MHNCI 10235; "São João da Graciosa" (25°23'21"S,48°52'57" W; 245 m), MHNCI 12844; "Sapetanduva" (25°27'22" S, 48°48'43" W; 20 m), MHNCI 11617. Municipality of Paranaguá: no specific locality (25°31'13" S, 48°30'34" W; sea level), MHNCI 11464; "Ilha do Mel" (25°32'32" S, 48°18'02" W; sea level), MHNCI 3543.

The first records of *Chironius fuscus* from Santa Catarina are based on two specimens (MHNCI 11878, 12022) obtained during field surveys in the "Centro de Estudos e Pesquisas Ambientais of the Universidade de Joinville" (CEPA/Univille), located in "Vila da Glória", municipality of São Francisco do Sul, northern coast of that State (26°13'10" S, 48°42'09" W; 305 m; Figure 1) (collection permit from IBAMA number 96/2004). The area is predominantly composed of lowland/lower montane dense ombrophylous forest at different stages of regeneration, ranging from secondary ("capoeira") to primary forests with low anthropogenic impact, located in slopes where the access is very difficult. The first specimen (male; adult; hemipenis partially everted; SVL = 570 mm; tail length = 320 mm; MHNCI 11878) was found dead on 19 December 2004, on the road, near a forested area. The second individual (female; adult; SVL = 615 mm; tail length = 370 mm; MHNCI 12022) was found active on the ground in a forested area on 03 April 2006.

Among all the specimens analyzed the largest total length corresponds to a female of 1490 mm; the largest male has 1336 mm. The tail length/total length ratio ranged from 0.34 to 0.36 in males and 0.36 to 0.37 in females. Pholidosis: supralabials 9 (n = 15) or 10 (n = 3); infralabials 10 (n = 14) or 9 (n = 4); temporals 1+1. Dorsals 10, without reduction, presenting (n = 14) or not presenting (n = 6) apical pits; paravertebral keels present and evident in adult males, but less evident (n = 4) or absent (n = 2) in adult females and little seen in one juvenile male. Ventrals 143-153 in males (mean 147.2; s 2.64; n = 13), 142-152 in

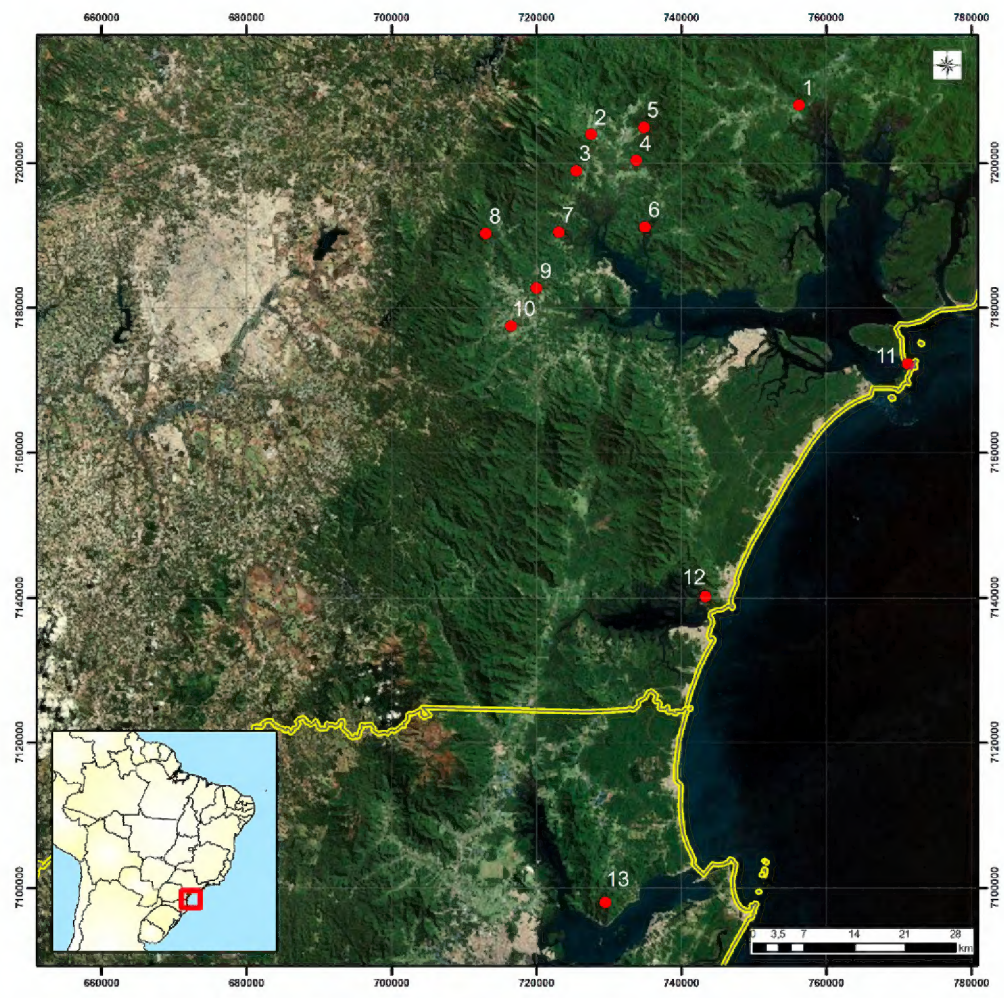

Figure 1. Localities of record of *Chironius fuscus* in the states of Paraná (PR) and Santa Catarina (SC). Municipality of Guaraqueçaba: 1 - Tagaçaba; Municipality of Antonina: 2 - Bairro Alto, 3 - Cacatu, 4 - PR-405, between Lageado and Fazenda Bom Jesus I, 5 - Reserva Natural do Rio Cachoeira, Trilha do Meio, 6 - Reserva Natural do Rio Cachoeira, mouth of the Faisqueira River, 7 - Curitibaíba River, PR-340; Municipality of Morretes: 8 - São João da Graciosa, 9 - Sapetanduva, 10 - Anhaia; Municipality of Paranaguá: 11 - Ilha do Mel; Municipality of Guaratuba: 12 - Cabaraquara, access to the Iate Clube; Municipality of São Francisco do Sul: 13 - Vila da Glória, CEPA/UNIVILLE.

females (mean 146.3; s 3.72; n = 6). Subcaudals 115-122 in males (mean 119.0; s 2.45; n = 9), 118-123 in females (mean 121.0; s 2.12; n = 5). Ventrals plus subcaudals 263-274 in males (mean 266.6; s 3.78; n = 9), 261-269 in females (mean 266.2; s 3.27; n = 5). Anal plate single. In order to analyze the pholidotic variation found in the species, Dixon *et al.* (1993) subdivided the existing sample in seven sub-samples (the seventh corresponding to the subspecies *C. f. leucometapus*), organized geographically. Based on the analysis of the number of ventrals plus subcaudals, these authors found no significant differences between the sub-samples. However, the variation observed (Dixon *et al.* 1993: figure 29, page 121) showed lower values for specimens from southeastern Brazil (sub-sample I) than for the Amazonian specimens (sub-samples II-VI), with a mean estimated based on the figure, between 266 and 267 scales. Our data (mean 266.43; s 3.48) are very similar to the values obtained by Dixon *et al.* (1993) for the sub-sample from the southeast region.

The hemipenis of *Chironius fuscus* was briefly described by Bailey (1955), based on a dissected (not everted) organ. Vellard (1928a, figure 4, plate 2; 1928b, figure 4, page 411) provided, respectively, a photograph and a drawing of one everted hemipenis of *Herpetodryas fuscus* (= *Chironius fuscus*). Vellard (1946; figures 9C and 9D, page 274) presented new illustrations, apparently from the same specimen showed in the anterior contributions, accompanied by a brief description of the shape and ornamentation, but without indicating the origin of the specimen examined (undoubtedly a specimen housed in the Instituto Butantan, probably collected in southeastern Brazil). In these figures, the hemipenis appears as a short and bent organ, with a "sub globular" apex (as a capitation), which we con-

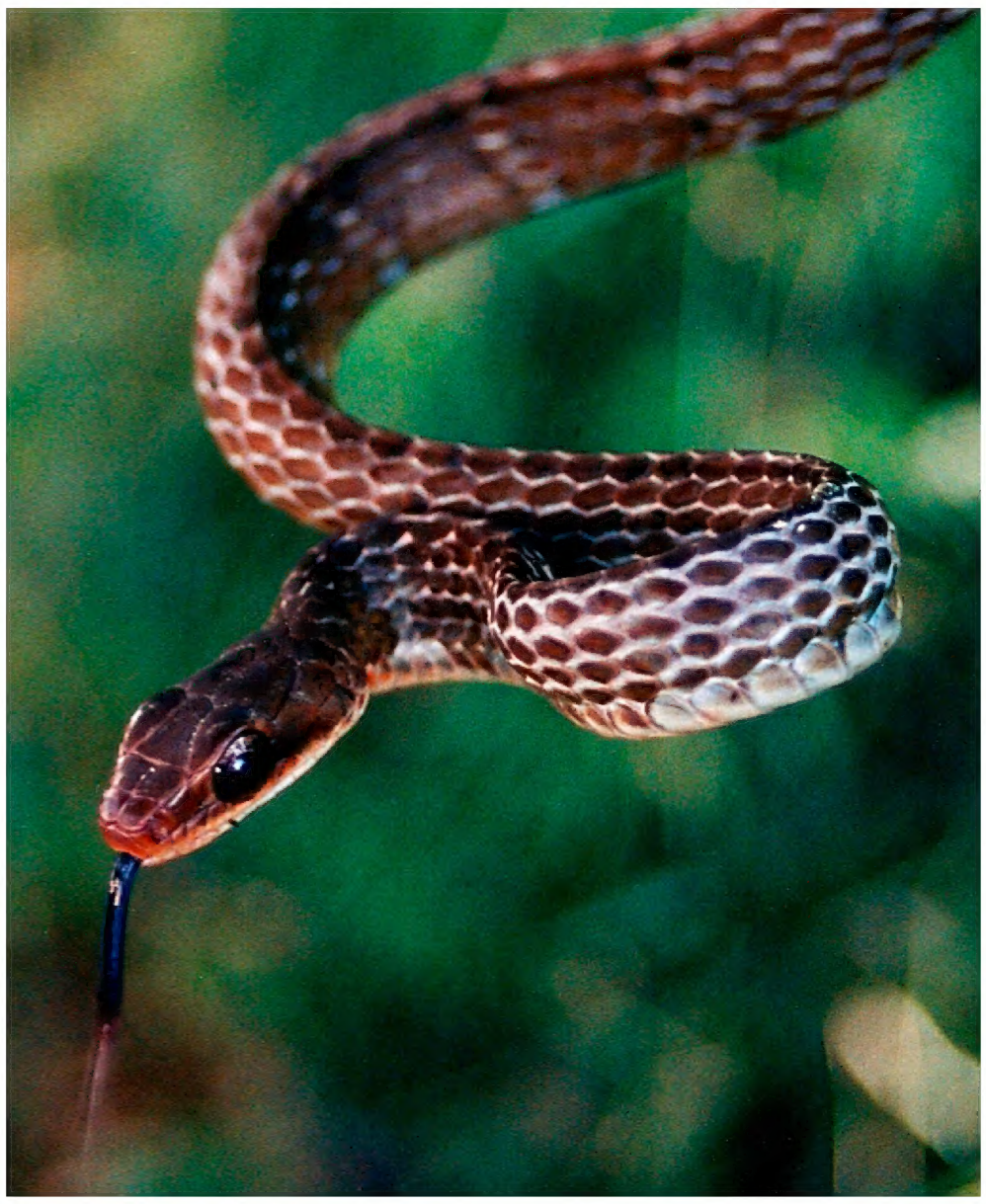

Figure 2. Living adult male specimen of *Chironius fuscus* (MHNCI 11164) from Antonina, Paraná State, Brazil. Photo by S.A.A.Morato.

sider to represent a preparation artifact. Dixon and others have provided drawings (figure 3, page 43; repeated as figure 27 at page 118; based on a specimen from Colombia) and a more detailed description based on nine specimens, all from Amazonian localities. Preparations of the organs of four specimens from southern Brazil (MHNCI 7625, 11164, 11957 and 12844) demonstrate that the hemipenis is simple, cylindrical, non-capitated. The sulcus spermaticus is undivided, centrolineal, ending in subapical position. A basal nude pocket is present. The proximal area located between the basal pocket and the sulcus spermaticus is covered with spinules. The proximal half of the body is covered with sub-equal spines, all but 3 or 4 basal, enlarged spines in the face not sulcate. The spines are replaced by papillae on distal half, which initially tend to form transverse fringes, but that was soon organized in papillate calyces well defined. The morphological pattern observed here does not differ from that observed and illustrated by Dixon *et al.* (1993).

The color pattern of the specimens from Paraná and Santa Catarina states (live and/or recently preserved) agree with those described for other populations from the Atlantic Forest (Bailey 1955; Marques *et al.* 2001; Argôlo 2004; Freitas 2011). The only juvenile specimen (total length 369 mm) presents brownish color, with 34 irregular lighter cross bands on the body and five on the tail, and conforms well to the general pattern known for southeastern populations of the species.

Despite the large altitudinal range reported by Dixon *et al.* (1993) in northern South America, the records from southern Brazil are restricted to at altitudes ranging from sea level to 305 m (slopes of the Serra do Mar). Our records of *Chironius fuscus* are directly associated with little disturbed forest habitats, characterized by lowland/submontane dense ombrophilous forest, similar to that reported by Marques and Sazima (2004) for the species in the state of São Paulo. However, Argôlo (2004) records the presence of the species in southeastern Bahia in disturbed environments (cacao plantations and bamboo thicket).

Our data demonstrate that southernmost populations of the *Chironius fuscus* (from São Paulo to Santa Catarina) present a continuous distribution along the Brazilian coast, not been registered in high areas of the Serra do Mar (above 305 m asl) and in the Brazilian southern plateau. We found no significant differences in morphological characters (pholidosis, color pattern and hemipenial morphology) between the southeastern and northeastern samples, corroborating the recognition of a single species in Eastern Brazil. However, the wide and disjunct distributional pattern of *C. fuscus*, as well as the variation reported between Amazonian and Atlantic Forest populations suggest that a comprehensive study remains necessary to assess the taxonomy of the whole complex.

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